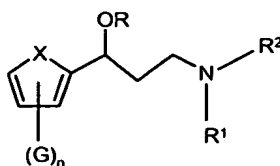


CLAIMS

1. A process for the preparation of a compound of Formula (1):

5



Formula (1)

wherein:

10 X is S, O or NR<sup>3</sup>, wherein R<sup>3</sup> is H or an organic group;

R is H or an organic group;

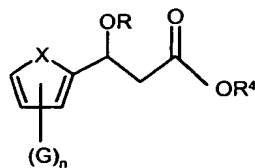
R<sup>1</sup> and R<sup>2</sup> each independently are H, optionally substituted alkyl or optionally substituted aryl;

G is a substituent; and

15 n is 0 to 3:

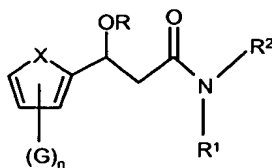
which comprises the steps:

(a) reacting a compound of Formula (2) with a compound of Formula NHR<sup>1</sup>R<sup>2</sup> to give a compound of Formula (3):



20

Formula (2)



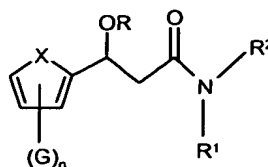
Formula (3)

25

wherein X, R, G and n are as defined above and R<sup>4</sup> is optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, optionally substituted heteroaryl or a combination thereof; and

30 (b) reducing the compound of Formula (3) to give a compound of Formula (1).

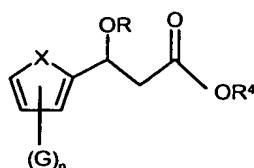
2. A process for the preparation of a compound of Formula (3):



Formula (3)

5

whereby a compound of Formula (2):



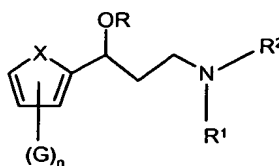
Formula (2)

10

is reacted with a compound of Formula  $\text{NHR}^1\text{R}^2$  to give a compound of Formula (3); wherein X, G, n, R,  $\text{R}^1$ ,  $\text{R}^2$  and  $\text{R}^4$  are as defined in claim 1.

3. A process for the preparation of a compound of Formula (1):

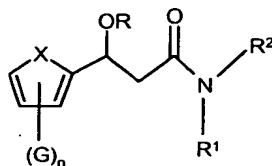
15



Formula (1)

in which a compound of Formula (3):

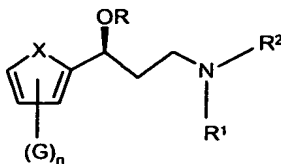
20



Formula (3)

- 25 is reduced to give a compound of Formula (1): wherein X, G, n, R,  $\text{R}^1$  and  $\text{R}^2$  are as defined in claim 1.

4. A process according to any one of claims 1 and 3 wherein the compounds of Formula (1) are of Formula (4):



Formula (4).

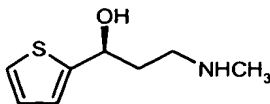
wherein X, G, n, R, R<sup>1</sup> and R<sup>2</sup> are as defined in claim 1.

5. A process according to any one of the preceding claims wherein X is S.

6. A process according to any one of the preceding claims wherein R is H or naphthyl.

7. A process according to any one of the preceding claims wherein one of R<sup>1</sup> and R<sup>2</sup> is H and the other is methyl.

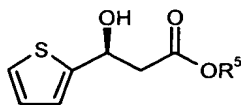
8. A process, according to any one of the preceding claims, for the preparation of a compound of Formula (10):



Formula (10)

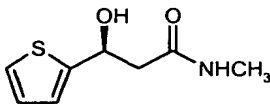
which comprises the steps:

(a) reacting a compound of Formula (9):



Formula (9)

where R<sup>5</sup> is optionally substituted C<sub>1-8</sub>alkyl, with methylamine to give a compound of Formula (11):

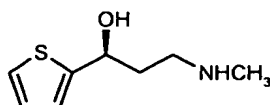


Formula (11)

and

(b) reducing the compound of Formula (11) to give the compound of Formula (10).

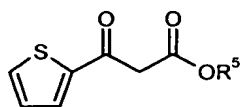
9. A process, according to any one of the preceding claims, for the preparation of a  
5 compound of Formula (10):



Formula (10)

which comprises the steps:

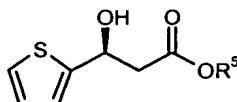
- 10 (i) acetylating 2-acetyl thiophene to give the compound of Formula (8):



Formula (8)

- 15 where R<sup>5</sup> is optionally substituted C<sub>1-8</sub>alkyl;

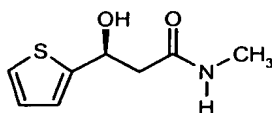
- (ii) reducing the compound of Formula (8) to give the compound of Formula (9):



Formula (9)

where R<sup>5</sup> is optionally substituted C<sub>1-8</sub>alkyl;

- (iii) reacting a compound of Formula (9) with methylamine to give a compound of  
25 Formula (11):

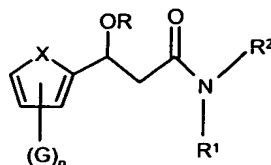


Formula (11)

30 and

- (iv) reducing the compound of Formula (11) to give the compound of Formula (10).

10. A compound of Formula (3):



Formula (3)

5 wherein

X is S, O or NR<sup>3</sup>, wherein R<sup>3</sup> is H or an organic group;

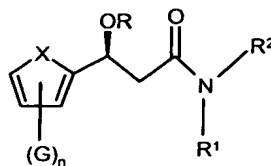
R is H or an organic group;

R<sup>1</sup> and R<sup>2</sup> each independently are H, optionally substituted alkyl or optionally substituted aryl;

10 G is a substituent; and

n is 0 to 3.

11. A compound of Formula (3), according to claim 10, of Formula (12):



Formula (12)

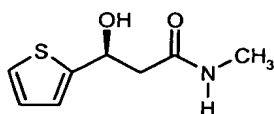
wherein X, G, n, R, R<sup>1</sup> and R<sup>2</sup> are as defined in claim 10.

20 12. A compound according to either claim 10 or claim 11 wherein X is S.

13. A compound according to any one of claims 10 to 12 wherein R is H or naphthyl.

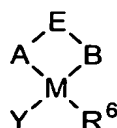
25 14. A compound according to any one of claims 10 to 13 wherein one of R<sup>1</sup> and R<sup>2</sup> is H and the other is methyl.

15. A compound according to any one of claims 10 to 14 of Formula (11):



Formula (11)

16. A catalyst of formula:



wherein:

5  $R^6$  represents a neutral optionally substituted hydrocarbyl, a neutral optionally substituted perhalogenated hydrocarbyl, or an optionally substituted cyclopentadienyl ligand;

A represents an optionally substituted nitrogen;

B represents an optionally substituted nitrogen, oxygen, sulphur or phosphorous;

E represents a linking group;

10 M represents a metal capable of catalysing transfer hydrogenation; and

Y represents an anionic group, a basic ligand or a vacant site;

provided that at least one of A or B comprises a substituted nitrogen and the substituent has at least one chiral centre; and

15 provided that when Y is not a vacant site that at least one of A or B carries a hydrogen atom.

17. A catalyst according to Claim 16 wherein A represents  $NR^7-$ ,  $-NR^8-$ ,  $-NHR^7$ ,  $-NR^7R^8$  or  $-NR^8R^9$  where  $R^7$  is H,  $C(O)R^9$ ,  $SO_2R^9$ ,  $C(O)NR^9R^{13}$ ,  $C(S)NR^9R^{13}$ ,  $C(=NR^{13})SR^{14}$  or  $C(=NR^{13})OR^{14}$ ,  $R^8$  and  $R^9$  each independently represents an optionally substituted hydrocarbyl, perhalogenated hydrocarbyl or an optionally substituted heterocyclyl group, and  $R^{13}$  and  $R^{14}$  are each independently hydrogen or a group as defined for  $R^9$ ; and B represents  $-O-$ ,  $-OH$ ,  $OR^{10}$ ,  $-S-$ ,  $-SH$ ,  $SR^{10}$ ,  $-NR^{10}-$ ,  $-NR^{11}-$ ,  $-NHR^{11}$ ,  $-NR^{10}R^{11}$ ,  $-NR^{10}R^{12}$ ,  $-PR^{10}-$  or  $-PR^{10}R^{12}$  where  $R^{11}$  is H,  $C(O)R^{12}$ ,  $SO_2R^{12}$ ,  $C(O)NR^{12}R^{15}$ ,  $C(S)NR^{12}R^{15}$ ,  $C(=NR^{15})SR^{16}$  or  $C(=NR^{15})OR^{16}$ ,  $R^{10}$  and  $R^{12}$  each independently represents an optionally substituted hydrocarbyl, perhalogenated hydrocarbyl or an optionally substituted heterocyclyl group, and  $R^{15}$  and  $R^{16}$  are each independently hydrogen or a group as defined for  $R^{12}$ ; provided that at least one of A or B comprises a substituted nitrogen and the substituent, represented by  $R^7$ ,  $R^8$ ,  $R^9$ ,  $R^{10}$ ,  $R^{11}$  or  $R^{12}$ , has at least one chiral center.

30 18. A catalyst according to Claim 17 wherein A represents  $-NR^7-$ ,  $-NR^8-$ ,  $-NHR^7$ ,  $-NR^7R^8$  or  $-NR^8R^9$  where  $R^7$  is H,  $C(O)R^9$ ,  $SO_2R^9$ ,  $C(O)NR^9R^{13}$ ,  $C(S)NR^9R^{13}$ ,  $C(=NR^{13})SR^{14}$  or  $C(=NR^{13})OR^{14}$ ,  $R^8$  and  $R^9$  each independently represents an optionally substituted hydrocarbyl, perhalogenated hydrocarbyl or an optionally substituted heterocyclyl group, and  $R^{13}$  and  $R^{14}$  are each independently hydrogen or a group as defined for  $R^9$ ; and B represents  $-NR^{10}-$ ,  $-NR^{11}-$ ,  $-NHR^{11}$ ,  $-NR^{10}R^{11}$ , or  $-NR^{10}R^{12}$  where  $R^{11}$  is H,  $C(O)R^{12}$ ,  $SO_2R^{12}$ ,  $C(O)NR^{12}R^{15}$ ,  $C(S)NR^{12}R^{15}$ ,  $C(=NR^{15})SR^{16}$  or  $C(=NR^{15})OR^{16}$ ,  $R^{10}$

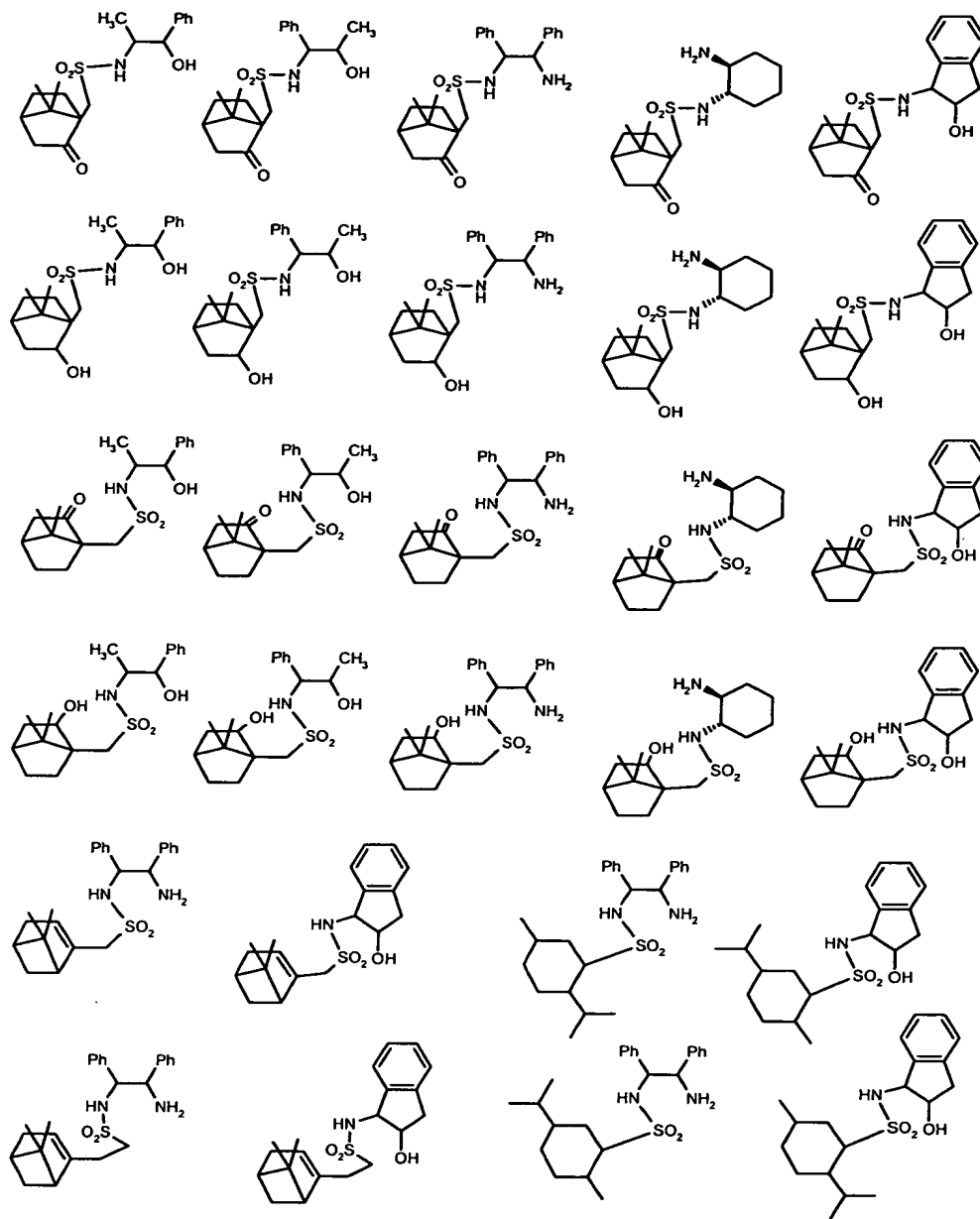
and  $R^{12}$  each independently represents an optionally substituted hydrocarbyl, perhalogenated hydrocarbyl or an optionally substituted heterocyclyl group, and  $R^{15}$  and  $R^{16}$  are each independently hydrogen or a group as defined for  $R^{12}$ ; provided that at least one of A or B comprises a substituted nitrogen and the substituent, represented by  $R^7$ ,  $R^8$ ,  $R^9$ ,  $R^{10}$ ,  $R^{11}$  or  $R^{12}$ , has at least one chiral center.

19. A catalyst according to Claims 17 or 18 wherein either A or B is present as a sulphonamide group represented by  $-NR^7$ -,  $-NHR^7$ ,  $NR^7R^8$ -,  $-NR^{11}$ -,  $-NHR^{11}$  or  $NR^{10}R^{11}$  wherein  $R^8$  and  $R^{10}$  are as hereinbefore defined, and where  $R^7$  or  $R^{11}$  is a sulphonyl group represented by  $-S(O)_2R^9$  or  $-S(O)_2R^{12}$ , that  $R^9$  and  $R^{12}$  is an optionally substituted hydrocarbyl, perhalogenated hydrocarbyl or an optionally substituted heterocyclyl group having at least one chiral center.

20. A catalyst according to Claim 19 wherein one of  $R^7$  or  $R^{11}$  is (1R) 1-(7,7-dimethyl-2-oxobicyclo[2.2.1]hept-1-yl)methanesulfonyl, (1S) 1-(7,7-dimethyl-2-oxobicyclo[2.2.1]hept-1-yl)methanesulfonyl, (1R,2S) 1-(7,7-dimethyl-2-hydroxybicyclo[2.2.1]hept-1-yl)methanesulfonyl, (1R,2R) 1-(7,7-dimethyl-2-hydroxybicyclo[2.2.1]hept-1-yl)methanesulfonyl, (1S,2R) 1-(7,7-dimethyl-2-hydroxybicyclo[2.2.1]hept-1-yl)methanesulfonyl, (1S,2S) 1-(7,7-dimethyl-2-hydroxybicyclo[2.2.1]hept-1-yl)methanesulfonyl, (2S) 1-(6,6-dimethylbicyclo[3.1.1]hept-2-ene)-2-ethansulfonyl, (2R) 1-(6,6-dimethylbicyclo[3.1.1]hept-2-ene)-2-ethansulfonyl, (2S) 1-(6,6-dimethylbicyclo[3.1.1]hept-2-ene)-2-methansulfonyl, (2R) 1-(6,6-dimethylbicyclo[3.1.1]hept-2-ene)-2-methansulfonyl, (1R,2R,5R) 5-isopropyl-2-methylcyclohexansulfonyl, or (1S,2S,5R) 5-isopropyl-2-methylcyclohexansulfonyl, (1S,2S,5R) 2-isopropyl-5-methylcyclohexansulfonyl.

21. A catalyst according to any one of Claims 16 to 20 wherein E is a linking group such that A and B are linked through 2, 3 or 4 atoms which are optionally substituted.

22. A ligand of formula:



5

and diastereomers or resolved forms thereof.